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FORM PTO 1390 (REV 12-29-99) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		9590.001.00
		U S APPLICATION NO (If known, see 37 CFR 1.5) 09/914624 New Application
INTERNATIONAL APPLICATION NO. PCT/GB00/00763	INTERNATIONAL FILING DATES 03/03/2000	PRIORITY DATE CLAIMED 03/03/1999
TITLE OF INVENTION FLUID SUPPLY SYSTEM		
APPLICANT(S) FOR DO/EO/US Donald Stuart MILLER		

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1 [x] This is a **FIRST** submission of items concerning a filing under 35 U.S.C 371.

2 [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371

3. [x] This express request to begin national examination procedures (35 U.S.C. 371 (f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371 (b) and PCT Articles 22 and 39(1).

4. [ ] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. [x] A copy of the International Application as filed (35 U.S.C. 371 (c)(2))

   a. [x] is transmitted herewith (required only if not transmitted by the International Bureau).

   b. [ ] has been transmitted by the International Bureau

   c [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).

6. [ ] A translation of the International Application into English (35 U S.C. 371 (c)(2)).

7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))

   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).

   b. [ ] have been transmitted by the International Bureau.

   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.

   d [X] Have not been made and will not be made.

8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).

9 [ ] An oath or declaration of the inventor(s) (35 U S C 371 (c)(4))

10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U S C. 371 (c)(5))

Items 11. to 16. below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 & 3.31 is included.

13. [ ] A FIRST preliminary amendment.

    [ ] A SECOND or SUBSEQUENT preliminary amendment

14. [ ] A substitute specification.

15. [ ] A change of power of attorney and/or address letter.

16. [ ] Other items or information:

U S APPLICATION NO (If known, see 37 CFR 1.5) 09/914624	INTERNATIONAL APPLICATION NO PCT/GB00/00763	ATTORNEY'S DOCKET NUMBER 9590.001.00

17. [x] The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) – (5)):

- [ ] Neither international preliminary examination fee (37 CFR 1 482) nor international search fee (37 CFR 1 445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO . .
- [X] International preliminary examination fee (37 CFR 1 482) not paid to USPTO but International Search Report prepared by the EPO or JPO . .
- [ ] International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1 445(a)(2)) paid to USPTO
- [ ] International preliminary examination fee paid to USPTO (37 CFR 1 482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)
- [ ] International preliminary examination fee paid to USPTO (37 CFR 1 482) and all claims satisfied provisions of PCT Article 33(1)-(4) . . . .

	CALCULATIONS PTO USE ONLY
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 1,000.00
Surcharge of $130.00 for furnishing the oath or declaration later than [ ] 20 [x] 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	$ 130.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	8 - 20 =	0	x 18.00	0.00
Independent claims	3 - 3 =	0	x 80.00	0.00
MULTIPLE DEPENDENT CLAIM(s) (if applicable)			x	$
TOTAL OF ABOVE CALCULATIONS =				$ 1,130.00
Reduction of ½ for filing by small entity, if applicable. A Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				565.00
SUBTOTAL =				$ 565.00
Processing fee of _____ for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				$
TOTAL NATIONAL FEE =				$
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). Assignment must be accompanied by appropriate cover sheet (37 CFR 3.28, 3 31) + (per property)				$
TOTAL FEES ENCLOSED =				$565.00
			Amount to be Refunded:	$
			Charged:	$

a. [x] A check in the amount of $565.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c [x] The Commissioner is hereby authorized to charge any additional fees which may be required or credit any overpayment to my Deposit Account No. 50-0911 A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

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FLUID SUPPLY SYSTEM

The present invention relates to a fluid supply system where a supply of clean fluid under pressure is connected to an entrainment vessel in which the clean fluid can take up another component.

Flow control in fluid supply systems is often achieved by valves. Valves can be damaged by matter entrained by fluids. It is a purpose of the present invention to provide a fluid supply system with a control valve arranged so that it is not damaged in the manner described above.

A fluid supply system employing a jet pump is disclosed in WO95/29792.

According to the invention there is provided a fluid supply system comprising a supply of clean fluid under pressure connected to an entrainment vessel in which the clean fluid can take up another component, an outlet from the container leading to a system outlet and a jet pump having a high pressure inlet, a lower pressure inlet and an outlet, the supply of pressurised clean fluid passing from the high pressure inlet to the lower pressure inlet of the jet pump en route for the inlet of the entrainment container and the outlet of the jet pump being connected through a valve to a junction between the outlet of the entrainment vessel and the system outlet.

When the valve is closed, the jet pump simply provides a conduit between its high pressure inlet and lower pressure inlet and the fluid flows through that conduit, then through the vessel and thence to the system outlet. When the carrier fluid enters the entrainment vessel it entrains the abrasive mixture therein and causes it to flow through the discharge tube 51. This is

advantageous. In prior systems the mixture exits from the bottom of the entrainment vessel. A valve is required to control the flow. Over time, the valve is damaged by the abrasive mixture. The present invention does not require such a valve to control the flow.

When the valve is open, the jet pump operates as such and reverses the pressure differential between the inlet and outlet of the vessel so that a small amount of fluid is drawn out of the inlet of the vessel into the jet pump, through the valve and back to the vessel through its outlet. Since clean fluid has, up to the time the valve was opened, been supplied to the inlet of the vessel and the majority of the fluid passing through the outlet of the jet pump when it operates as such is clean fluid from the high pressure inlet, the valve receives substantially clean fluid and so is not damaged by any other components in the system. Furthermore, any other components in the conduits downstream of the vessel in its normal operating mode are drained back into the vessel and so do not stagnate in the system downstream of the vessel.

The effect of opening the valve is to reduce the supply of other components in the fluid reaching the system outlet but some fluid will still be supplied. If it is desired to cut off the supply of fluid to the system outlet completely, then a further valve should be provided downstream of the junction between the conduits from the valve and the outlet of the vessel. If this valve is operated during normal flow of the system (with the jet pump valve closed), it will have to operate while carrying the other components in the fluid flow. Any damage to the further valve can be alleviated by providing it with a flushing system, for example connected to the supply of clean fluid, valves in the flushing system being opened before the further valve is closed in order to flush out other components from this valve. The presence of other

components in the further valve can be reduced by first opening the jet pump valve.

As a subsidiary feature of the invention defined above, or as an independent feature, a fluid transfer system can be provided from a first container to a second, comprising a first pump and a jet pump, the pump taking fluid from the second container and feeding it under pressure to the high pressure inlet of the jet pump, the lower pressure inlet of the jet pump being connected to the first container and the outlet of the jet pump being connected to the second container. The suction of the first pump makes room in the second container, the first pump drives the jet pump and the jet pump makes the transfer. The fluid in its transfer path from the first container to the second does not pass through the first pump, which is thereby protected from any damage which could be caused by such passage.

Examples of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows an abrasive mixture dispensing apparatus,

Figure 2 shows a discharge vessel and its associated filling reservoir,

Figure 3 shows an alternative system to that of Figure 2,

Figure 4 is a diagram of the interior of the discharge vessel of Figure 1,

Figure 5 shows an alternative arrangement to that of Figure 4 where a filter has replaced the valve arrangement,

Figure 6 shows the filter arrangement of Figure 5 for use with coaxial conduits,

Figures 7a and 7b show alternative arrangements of conduits connected to the pressure vessel and

Figure 8 shows an alternative dispensing system.

As shown in Figure 1, carrier fluid in the form of water is supplied from a water feed tank 31 by means of a pump 32 through a flexible module connection hose 33 to a slurry module 34. The inlet to the slurry module 34 has a non-return valve 35 and an emergency depressurisation valve 36. A pressure gauge 37 and a relief valve 38 are also connected downstream of the non-return valve.

As shown in more detail in Figure 2, abrasive material is introduced into the carrier fluid from a refill unit 41 which is connected to a discharge vessel 1 by means of a pair of conduits 7 and 8, shown in greater detail in Figure 2. A pump 14 in conduit 7 pressurises the top of the refillable reservoir 41 containing an abrasive mixture, so that abrasive mixture is forced through the conduit 8 to the vessel 1. A filter 10 is located on the entry to the conduit 8 so as to stop the flow when the vessel 1 is filled with abrasive. The pump 14 may be sensitive to the flow reduction and thus switch off.

Figure 3 shows an alternative arrangement where the direct connection of the pump 14 to handle the flow of fluid from vessel 1 to reservoir 41 is replaced by an indirect connection. In Figure 3, the pump 14 takes fluid from a filtered exit from the reservoir 41 and feeds the high pressure inlet of a jet pump 15. The lower pressure inlet of the pump 15 comes from the filtered exit port of the vessel 1 and the jet pump outlet is connected to the top of the reservoir 41. In this way, the pump 14 is better isolated from any abrasive which may pass through the filter 10 from the vessel 1.

The two conduits 7 and 8 are controlled by a valve assembly including a valve member 2 (see Figure 4) which can be moved by means of a lever 3 pivoted about a shaft 5 carried in bearings 4 in the upper face of the discharge vessel 1 between an operative position in which it closes

at the two conduits 7 and 8 and an inoperative position in which the two conduits 7 and 8 are open. The valve member 2 is located in the interior of the discharge vessel 1. It controls the two conduits in a compact manner, which is important when the discharge vessel has to withstand high pressures of the order of 400 MPa when the internal volume may be only 20% of its exterior volume.

Although the conduits 7 and 8 are shown diagrammatically in Figure 4 side by side, they may be arranged in a variety of relative positions. Figure 7a shows the two conduits ending in semicircles with a common diameter boundary wall. The valve member 2 is circular and can be moved by the lever 3 from the position shown in Figure 7a in full lines, the inoperative position, to the position shown in dotted lines, the operative position, in which the valve member 2 is aligned with the circle formed by the two conduits 7 and 8 and fully closes them.

Figure 7b shows an alternative arrangement in which the conduit 7 is arranged coaxially within the conduit 8 and both conduits will be closed by the valve member 2 when in the operative position shown in dotted lines in Figure 7b. The two conduits 7, 8 could be mutually spaced, provided that the valve member 2 is large enough to close them both in the operative position, but arranging the two conduits in a single penetration of the pressure vessel wall reduces the stress loadings in that wall, important at high pressures.

When the vessel 1 is used for making an abrasive mixture of carrier fluid and abrasive particles, passage through the conduit 8 can be controlled by a filter 10 rather than the valve 2 to prevent particles in the vessel 1 escaping through the conduit 8. Figure 6 shows the filter in position and Figure 5 shows the filter 10 encircling a tapering coaxial channel leading from the

conduit 7 in the coaxial conduit arrangement already described with reference to Figure 7b.

Figure 6 shows the filter 10 in position below conduit 8 in a discharge vessel 1. Conduit 7 is connected by a diffuser 11 to a spreader 12 which together reduce the velocity of the mixture entering the vessel 1 through conduit 7 and carries it away from the conduit 8. When the velocity of the fluid entering the vessel has been reduced, abrasive particles in the entering mixture will drop to the bottom of the vessel and the carrier liquid can be withdrawn through the conduit 8, the filter 10 helping to remove any abrasive particles still entrained in the carrier liquid. It may be arranged that the diffuser 11 and filter 10 are movable with the valve member 2 (when both filter 10 and valve member are present) so that they are aligned with the conduits 7 and 8 when the valve member 2 leaves these conduits open.

Besides the conduits 7 and 8, a further conduit 6 extends from the top of the vessel 1. Conduit 6 leads to the lower pressure inlet 63 of the jet pump 61 in Figure 1. The conduit 6 may be arranged to that it is closed by an additional valve member not shown when the valve 2 is in its inoperative position, and is opened when the valve is in its operative position, so that the conduit 6 is opened when the conduits 7 and 8 are closed and vice versa. With this arrangement, and a suitably directed nozzle connected to the conduit 6, it may be arranged that the filter 10 is cleaned by fluid entering the conduit 6 when the conduits 7 and 8 are closed.

Although the conduits 7 and 8 are close together, the kinetic energy of the abrasive mixture entering the vessel 1 through conduit 7 is such that fluid will not pass directly to the conduit 8, but only after it has lost velocity and moved away from the conduit 8 to deposit the

abrasive particles within the container. This arrangement within the discharge vessel therefore serves to strip the incoming fluid of its abrasive particles before returning the stripped fluid through the conduit 8. To prevent abrasive particles becoming trapped between the valve member 2 and the mouth of the conduits 7 and 8, the lever 3 is preferably spring-loaded so as to bias the valve member 2 against the mouths of conduits 7 and 8 and the surrounding internal surface of the vessel.

In normal operation of the apparatus of Figure 1, the abrasive mixture is fed from the part of the discharge vessel remote 1 from the transfer valve 2 through a discharge tube 51 controlled by a restrictor 57 which tube 51 is joined to the outlet of the non-return valve 35 in the slurry module, the combined flow being connected by means of an isolation valve 52 through a flexible discharge hose 53 to a system outlet nozzle 54 which applies the abrasive mixture to the workpiece. The flow of abrasive mixture from the discharge vessel 1 is controlled by means of a valve 65 and a jet pump 61 which has a high pressure inlet 62, a lower pressure inlet 63 and an outlet 64. The high pressure inlet 62 is connected to the outlet of the non-return valve 35 and the lower pressure inlet 63 is connected to the conduit 6 of the discharge vessel 1. The outlet is connected through the valve 65 to the direct line from the outlet of the non-return valve 35 which line contains an adjustable restriction 66. When this last-mentioned valve 65 is closed, carrier fluid flows through the jet pump from the high pressure inlet 62 to the lower pressure inlet 63 and then through the discharge vessel 1 where it entrains the abrasive mixture therein and causes it to flow through the discharge tube 51 and the isolation valve 52 to the nozzle 54. The restriction 66 is adjusted to mix plain carrier fluid with the abrasive mixture from the tube 51 to control the concentration of abrasive reaching the nozzle 54.

The valve 52 can be closed to stop the flow to the nozzle 54 when valve 65 is closed, and to stop air being drawn into the system through the nozzle 54 when valve 65 is open. In applications where it is necessary rapidly to stop and start discharge, valve 52 has to operate under pressure. In order to prevent abrasive wear a ball valve is used for valve 52, with the same size bore as its inlet and outlet pipes. Ball valves are not suitable for on/off operations with large pressure differentials. Also micron and sub-micron particles can enter the clearances between a ball and its seats. Under high loading during valved operation particles can become embedded in the sliding surfaces and lead to rapid wear. During ball rotation particles can also enter the space between the ball and its housing. A valve 55, which only sees clean water, is used to provide a by-pass around valve 52. The by-pass circuit 56 leading from the clean water supply from the valve 35 provides a flushing flow between the ball in valve 52 and its housing in order to flush abrasive particles from the cavity between the ball and its housing and to provide a flow of water from the cavity to the valve outlet, as the bore in the ball cross-connects between the cavity and the valve's outlet.

When it is required to stop flow at the nozzle 54, valve 65 is opened and, after a brief delay to clear abrasive from the pipework to valve 52, valve 55 is opened to flush out valve 52; then valve 52 can be closed without a large pressure differential followed by valve 55 to stop flow at the nozzle. When the valve 65 is open, the jet pump action is started and the flow through the lower pressure inlet 63 of the jet pump is reversed from that already described, so that the flow through the discharge tube 51, the discharge vessel 1 and the lower pressure inlet 63 to the jet pump is reversed. This clears the discharge tube 51 of any abrasive mixture and prevents the

formation of a plug of abrasive material therein which might hinder subsequent operation of the apparatus. The constriction 57 on the end of tube 51 discourages the continued flow of abrasive upwards through the tube 51 when valve 65 is opened which might leave a slug of abrasive in the tube 51. The escape route via 63, 64 and 65 is of less resistance than the route through the two constrictions 67 and 66. When the valve 52 is closed, carrier fluid flows down the tube 51 to clear any compaction of abrasive particles which may have occurred in the vessel 1 due to interparticle forces and to provide flow passages in the particle bed.

When it is desired to supply the abrasive mixture to the nozzle again, the valve 65 is closed, the jet pump action stops and the carrier fluid simply flows between the inlets 62 and 63 of the jet pump to entrain the abrasive mixture in the discharge vessel 1 and transfer it through the discharge tube 51 to the nozzle 54, as already described.

When the whole apparatus has been at rest, the valve 65 associated with the jet pump 61 is initially opened in order that the initial flow through the discharge tube is downwards back into the discharge vessel, again to clear any plug of abrasive material which may have formed. After this start-up procedure, the valve 65 is closed and the jet pump 61 action ceases.

Various methods can be used for refilling the vessel 1 with abrasive mixture. One such method has been described in EP-A-276 219. Figures 1 and 2 illustrate the use of a single discharge vessel 1; Figure 8 illustrates the use of a pair of discharge vessels. In Figure 2, the hand pump 14 is operated to cause the flow of abrasive mixture through the refill unit 41 and the conduits 7 and 8 of discharge vessel 1 in a circulating path. The abrasive

material in the mixture passes into the discharge vessel 1 and the material sinks under gravity towards the bottom of the discharge vessel 1, leaving the carrier fluid part of the mixture to return through the transfer valve and the hand pump 14 back to the remote end of the refill unit 41. By this operation, abrasive material is transferred from the refill unit 41 to the discharge vessel 1 until the refill unit 41 is exhausted of abrasive material, after which the transfer valve is closed and the refill unit 41 can be replaced or recharged. Provided that an adequate concentration of abrasive material is maintained in the discharge vessel 1, the transfer of abrasive material from refill unit 41 to the discharge vessel 1 can continue in batches while the abrasive mixture is continuously discharged from the nozzle 54. Only if the concentration of the abrasive mixture falls below the desired level or the use of the abrasive mixture at the nozzle 54 is temporarily not required is the jet pump valve 65 opened to stop the supply of abrasive mixture to the nozzle 54.

Figure 8 shows the twin discharge vessel system. Instead of having conduits 7 and 8 in vessel 1 through which an abrasive mixture can be circulated, such conduits 7 and 8 are provided in a separate pressure vessel 70 and the separate pressure vessel 70 is arranged to transfer fluidised abrasive mixture to the main pressure vessel 1. This makes it easier for a continuous supply of abrasive mixture to be fed from the main pressure vessel 1 through the tube 51. The vessel 70 is provided with inlet and outlet conduits 7' and 8' connected through valves 71 and 72 to a refill unit 41 which operates in the same way as described above with reference to Figure 1 and will not be further described. A connection is made from the outlet conduit 64 of the jet pump 61 through a valve 79 to the outlet conduit 8 of the separate pressure vessel 70. A depressurisation valve 81 and depressurisation orifice 82 are connected between the valve 79 and the outlet conduit

8. The outlet conduit 76 from the separate pressure vessel 70 is connected through a valve 80 to the inlet conduit 7 of the main pressure vessel 1 and a connection is made as shown in Figure 8 between the outlet of the one-way valve 35 and the junction between the valve 80 and the separate pressure vessel 70 through a valve 74, filter 75 and orifice 83.

The apparatus of Figure 8 operates to supply abrasive mixture to the nozzle 54 as described above with reference to Figure 1. The valve 52 is open and the valve 65 closed, clean fluid passing through the conduits 62 and 63 of the jet pump 61 into the pressure vessel 1 and abrasive mixture is forced out through the conduit 51. As the abrasive mixture in the vessel 1 becomes low, the valves 80 and 79 are both opened so that the jet pump operates as such and pumps clean fluid through the valve 79 to fluidise an abrasive mixture which has already been introduced into the separate vessel 70 by the hand pump associated with the refill unit 41 connected thereto. Abrasive mixture is thus forced through the conduit 76 and valve 80 into the main pressure vessel 1, induced by the suction towards the conduit 63 created by the operation of the jet pump 61. Abrasive mixture thus continues to leave the main pressure vessel 1 through conduit 51 and provided that the rate of introduction of abrasive mixture through the valve 80 is greater than the rate of its leaving through the conduit 51, the main pressure vessel 1 will be refilled with abrasive mixture. Once it is so refilled, the valves 80 and 79 are closed so that normal operation of the main system as described with reference to Figure 1 continues. The valve 81 is then opened to reduce the pressure in the separate vessel 70 which can then be refilled from the reservoir 41 as already described. The valve 74 can be opened to flush out the connection between the vessels 70 and 1 and after the seat of the valve 80 has been cleared of abrasive mixture, it can be closed without damage.

CLAIMS

1. A fluid supply system including means (31,32) for supplying fluid under pressure connected to an inlet (6) of an entrainment vessel (1) in which the fluid can take up another component, an outlet (51) from the entrainment vessel (1) leading to a system outlet (54), and a jet pump (61) having a high pressure inlet (62), a lower pressure inlet (63) and an outlet (64), the supply of pressurised fluid passing from the high pressure inlet (62) to the lower pressure inlet (63) of the jet pump (61) en route for the inlet (6) of the entrainment vessel (1), the outlet (64) of the jet pump (61) being connected through a valve (65) to a junction between the outlet (51) of the entrainment vessel (1) and the system outlet (54), and a further valve (52) provided downstream of the junction between the conduits from the valve (65) and the outlet (51) of the vessel (1).

2. A system according to claim 1, wherein the further valve (52) is operable to stop fluid flow from the system outlet (54) when the valve (65) is closed, and to stop air being drawn in through the system outlet (54) when the valve (65) is open.

3. A system according to claim 2, wherein the further valve (52) is provided with a flushing system.

4. A fluid transfer system according to claim 1, 2 or 3, comprising a further vessel (41) and means for transferring fluid from the entrainment vessel (1) to the further vessel (41), which means includes a first pump (14) and a further jet pump (15), the first pump (14) taking fluid from the further vessel (41) and feeding it under pressure to the high pressure inlet of the jet pump (15), the low pressure inlet of the jet pump being connected to the entrainment vessel (1) and the outlet of the jet pump (15) being

connected to the further vessel (41).

5. A fluid transfer system according to claim 1, 2, or 3, including an additional entrainment vessel (70) having a supply (41) of the said another component, and an outlet (76) in fluid communication with an additional inlet (7) of the entrainment vessel (1); means (78) for connecting the outlet (64) of the jet pump (61) to the additional vessel (70) to cause fluid to flow from the high pressure inlet (62) to the additional vessel (70) in which the fluid can take up the said another component and thence pass from the additional vessel outlet (76) to said entrainment vessel (1) in order to charge the entrainment vessel with the said other component (1) whilst maintaining flow to said system outlet (54) from entrainment vessel (1) outlet (51).

6. A fluid transfer system according to claim 5, comprising a further vessel (41) containing the said another component, and means for transferring fluid from the additional entrainment vessel (70) to the further vessel (41), which means includes a first pump (14) and a further jet pump (15), the first pump (14) taking fluid from the further vessel (41) and feeding it under pressure to the high pressure inlet of the jet pump (15), the low pressure inlet of the jet pump being connected to the additional entrainment vessel (70) and the outlet of the jet pump (15) being connected to the further vessel (41).

7. A fluid supply system including an entrainment vessel (1); means (31,32,61) for supplying fluid under pressure to an inlet (6) of the entrainment vessel (1) in which the fluid can take up another component, an outlet (51) from the entrainment vessel (1) leading to a system outlet (54); an additional entrainment vessel (70) having a supply (41) of the said another component, and an outlet (76) in fluid communication with an additional inlet (7) of the entrainment vessel (1); means (79) for diverting fluid from

said inlet (6) to the additional vessel (70) in which the fluid can take up the said another component and causing fluid to pass from the additional vessel outlet (76) to said entrainment vessel (1) in order to charge the entrainment vessel with the said other component (1) whilst maintaining flow to said system outlet (54) from entrainment vessel (1) outlet (51), and a valve (52) provided downstream of the outlet (51) from the entrainment vessel.

8. A fluid transfer system for transferring fluid from a first container (1) to a second container (41), including a first pump (14) and a jet pump (15), the first pump (14) taking fluid from the second container (41) and feeding it under pressure to the high pressure inlet of the jet pump (15), the low pressure inlet of the jet pump being connected to the first container (1) and the outlet of the jet pump (15) being connected to the second container (41).

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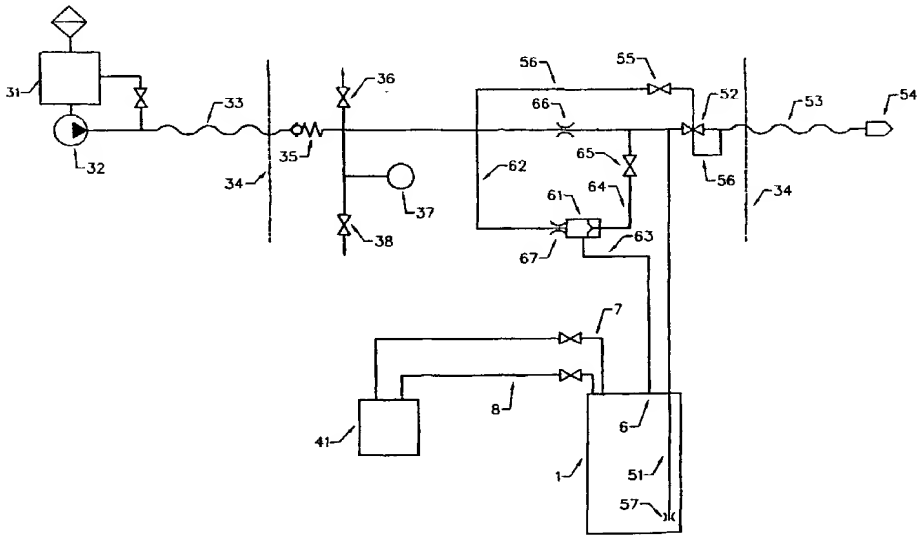
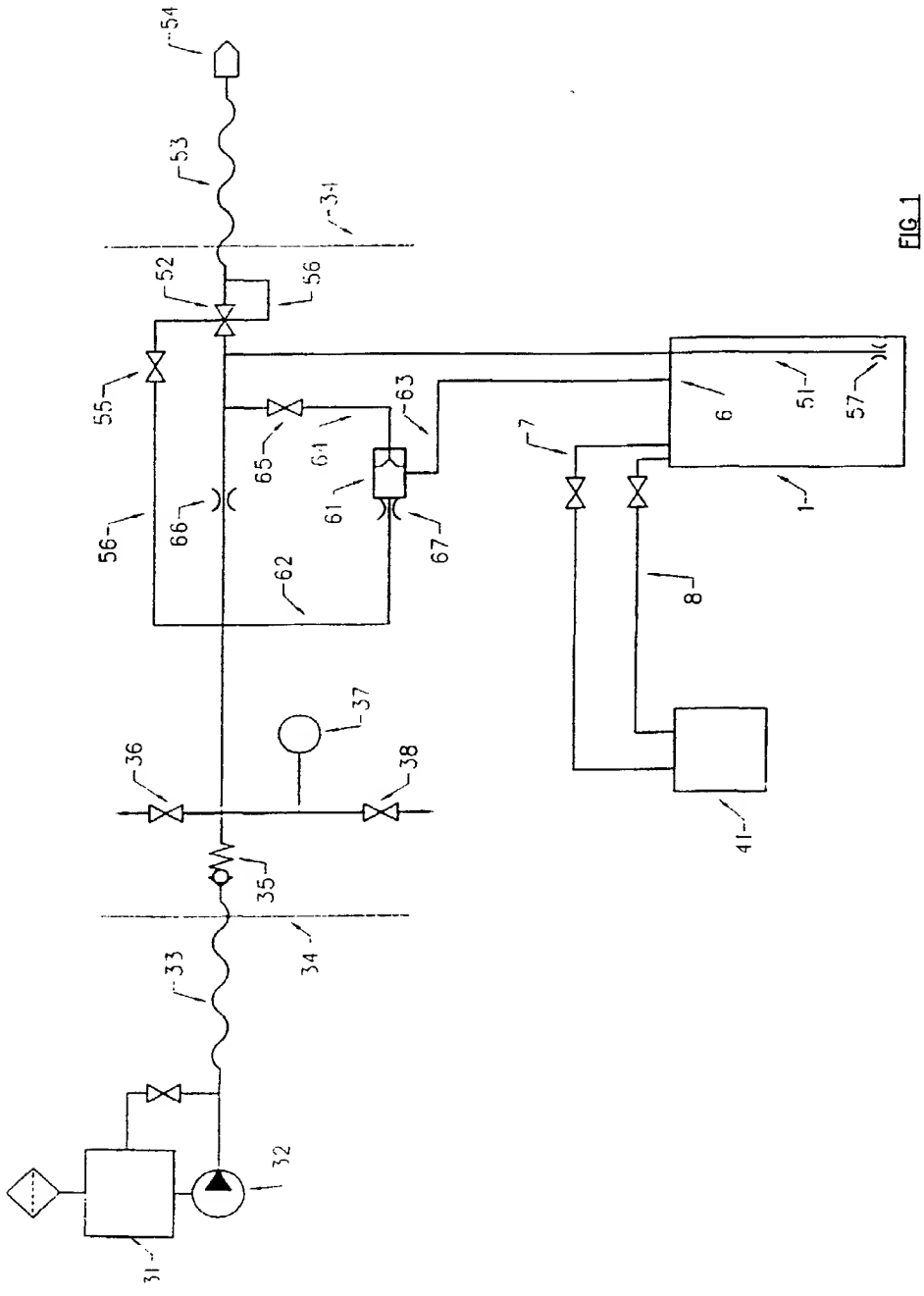
(54) Title: FLUID SUPPLY SYSTEM



(57) Abstract: A fluid supply system including means (31, 32) for supplying fluid under pressure connected to an inlet (6) of an entrainment vessel (1) in which the fluid can take up another component, an outlet (51) from an entrainment vessel (1) leading to a system outlet (54), and a jet pump (61) having a high pressure inlet (62), a lower pressure inlet (63) and an outlet (64), the supply of pressurised fluid passing from the high pressure inlet (62) to the lower pressure inlet (63) of the jet pump (61) en route for the inlet (6) of the entrainment vessel (1), and the outlet (64) of the jet pump (61) being connected through a valve (65) to a junction between the outlet (51) of the entrainment vessel (1) and the system outlet (54).

WO 00/52679 A3


54
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3-1
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55
63
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61-1
61
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1
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FIG 1

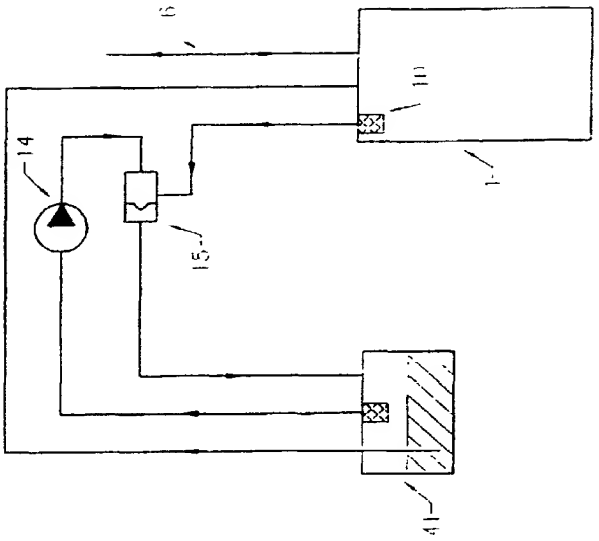

FIG 3

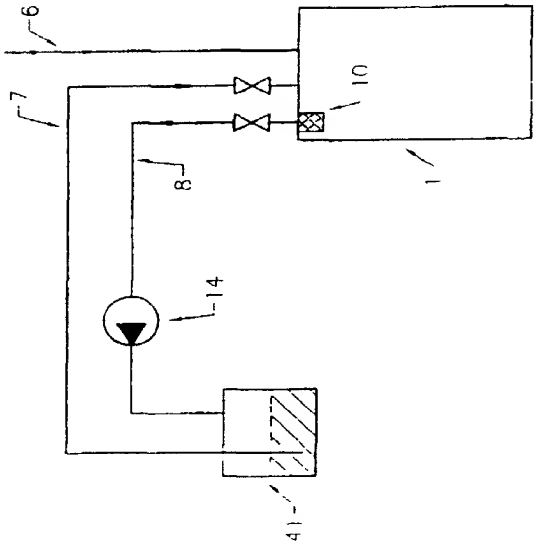

FIG 2

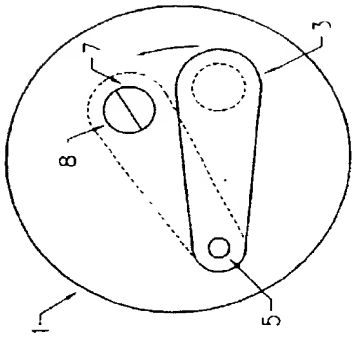

FIG 7a

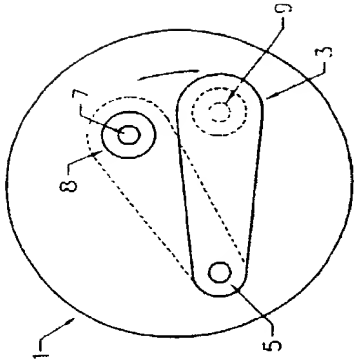

FIG 7b

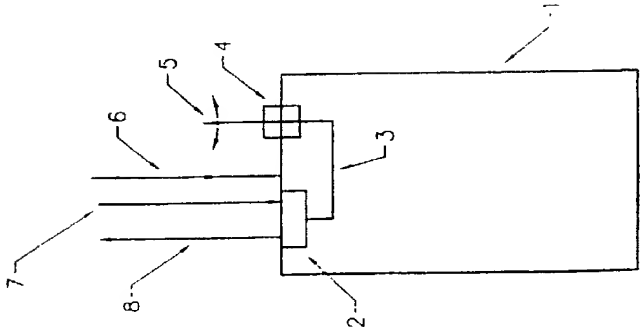

FIG 4

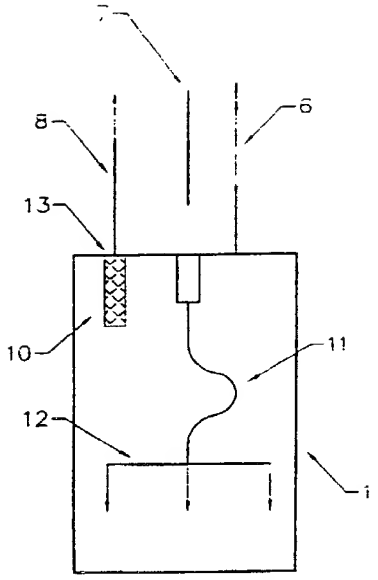

FIG 6

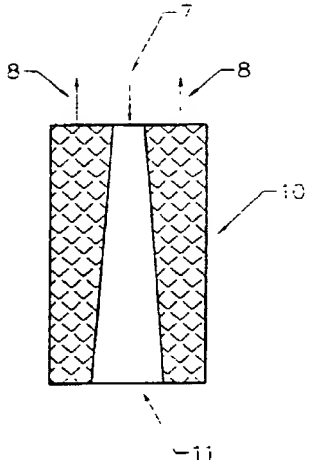

FIG 5

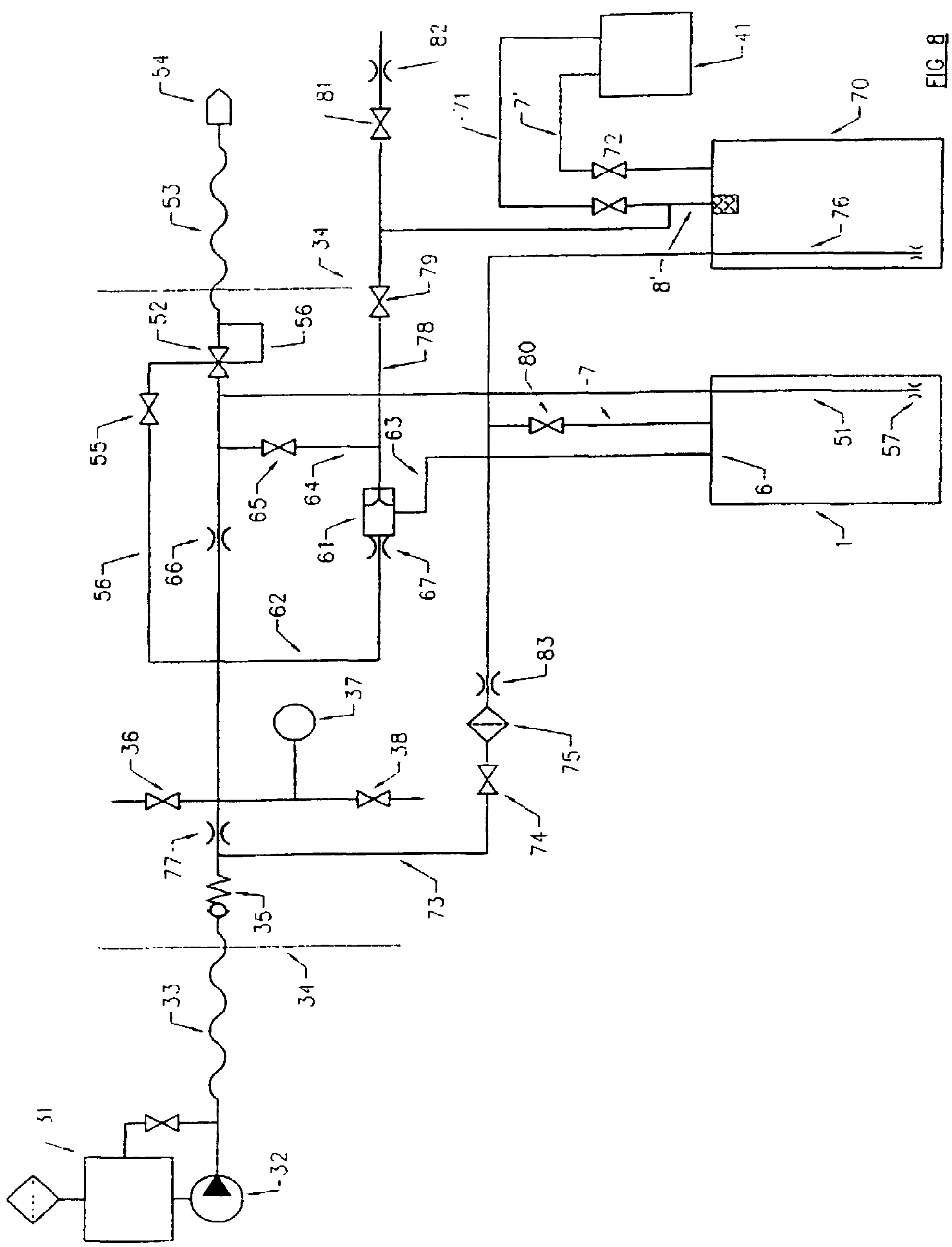

FIG 8

Docket No.: 9590.001GB

Declaration, Power of Attorney and Petition

WE (I) the undersigned inventor(s), hereby declare(s) that:

My residence, post office address and citizenship are as stated below next to my name.

We (I) believe that we are (I am) the original, first, and joint (sole) inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled

FLUID SUPPLY SYSTEM

the specification of which

☐	is attached hereto.		
☐	was filed on		
		as Application No.	
		and amended on	
☒	was filed as PCT international application		
	Number	PCT/GB00/00763	
	on	March 3, 2000	
	and was amended under PCT Article 19		
	on		(if applicable).

We (I) hereby state that we (I) have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We (I) acknowledge the duty to disclose information known to be material to the patentability of this application as defined in Section 1.56 of Title 37 Code of Federal Regulations.

We (I) hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT international application having a filing date before that of the application on which priority is claimed. Prior Foreign Application(s)

Application No.	Country	Day/Month/Year	Priority Claimed			
9904914.0	Great Britain	01/03/99	X	Yes	☐	No
			☐	Yes	☐	No
			☐	Yes	☐	No
			☐	Yes	☐	No

We (I) hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below.

(Application Number) (Filing Date)

We (I) hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or §365 of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

Application Serial No	Filing Date	Status (pending, patented, abandoned)

(4) And we (I) hereby appoint Song K. Jung, Reg. No. 35,210, John M. Kelly, Reg. No. 33,920, Rebecca A. Goldman, Reg. No. 41,786 and Teresa M. Arroyo, Reg. No. P-50,015 as our (my) attorneys, with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith; and we (I) hereby request that all correspondence regarding this application be sent to Song K. Jung of Long Aldridge & Norman LLP, Attorneys At Law, 6th Floor, 701 Pennsylvania Avenue, N.W., Washington, D.C. 20004.

We (I) declare that all statements made herein of our (my) own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1-00

Donald Stuart MILLER
NAME OF FIRST INVENTOR

Donald Stuart Miller
Signature of Inventor

29 May 2002
Date

Residence: Brookside, Church Walk
Harrold, Bedfordshire GBX

Citizen of Great Britain

Post Office Address: Same As Above

TOTAL P.03

TOTAL P.03